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FOREST SURVEY RELEASE NO. 44 JUNE 15, 1939

FOREST RESOURCES OF NORTH CENTRAL GEORGIA

by
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A Progress Report by

THE SOUTHERN FOREST SURVEY

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FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to determine the extent and condition of forest lands and to make an inventory of the present supply of timber and other forest products thereon, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made Sept. 21, 1935, to Dec. 21, 1935, and two field canvasses of forest industrial plants to determine forest drain, the last of which was made during July 1937. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these survey data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

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Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

FOREST RESOURCES OF NORTH CENTRAL GEORGIA

General Description

North central Georgia (Forest Survey Unit Georgia No. 4) is an agricultural area of almost 6½ million acres embracing 32 counties and extending southwesterly in a broad band across the State from its eastern to its western boundary (see map, fig. 1). The chief cash crop is cotton, which is grown on over 600,000 acres and is made into textiles at about 120 factories having a total of approximately 2 million spindles. Atlanta, the largest city, with over one-fourth of all the people in this entire area, is one of the biggest manufacturing and distributing communities in the South.

How important are the forests that cover 2½ million acres, or over four times as much area as the cotton fields? And how can these forests be made more valuable to the people of this unit? The Forest Survey made an inventory of the forest resources and studied the wood-using industries for the purpose of finding answers to these questions. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

With the exception of some of the northernmost counties, which extend over into the Blue Ridge foothills, the northern three-fifths of the area is in the upper Piedmont province, where elevations range from less than 700 to more than 1,300 feet above sea level and the land surface is rolling to hilly with steep slopes only along the stream borders. The southernmost tier of counties, or about two-fifths of the area, is in the lower Piedmont, with elevations ranging from less than 600 to more than 900 feet. Here the topography is more dissected, with narrower ridges and steeper slopes, than in the upper Piedmont.

The entire area is well drained by the Chattahoochee, Savannah, and other rivers flowing generally southward. The rainfall is about 50 inches per annum; the growing season is about 220 days per annum. As determined in 1936 by the Survey (table 1), 40 percent of the area was in some stage of forest growth, 57 percent was used for agriculture, and 3 percent was included in cities, towns, and villages, and in railways, highways, and other rights-of-way.

Included among the principal cities and towns are Atlanta, LaGrange, Athens, Decatur, and Griffin. Slightly less than half the total population of 956,000 (1930 Census) lives in incorporated towns and cities of 2,500 population or larger, while most of the remainder live on farms or in small communities. Although the total population has shown a steady increase since 1900 and the urban population has more than tripled, the rural population has remained practically stationary.

By 1860 there were several important railroad lines, and now north central Georgia has a maze of railroads, most of which connect at Atlanta. The principal railways are the Southern, the Louisville and Nashville, the Seaboard Air Line, the Central of Georgia, and the Atlanta and West Point. There is an excellent road system composed of paved and gravelled highways supplemented by many dirt roads. At least eight paved roads radiate from Atlanta to the major divisions of this area.

Table 1. - Total area classified according to land use, 1936

Land use	Area		Proportion of total area	
	Acres		Percent	
Forest:				
Productive	2,549,000		40.2	
Nonproductive	2,400		negl.	
Total forest		2,551,400		40.2
Nonforest:				
Agriculture:				
In cultivation:				
Old cropland	2,744,500		43.3	
New cropland	27,600		.4	
Out of cultivation:				
Idle	314,100		4.9	
Abandoned	264,600		4.2	
Pasture	247,500		3.9	
Total agriculture	3,598,300		56.7	
Other nonforest	195,900		3.1	
Total nonforest		3,794,200		59.8
Total area		6,345,600		100.0

Agriculture, which gives employment to approximately 128,000 of the 393,000 gainfully employed (in 1930), is the principal industry. Second in importance is the large and rather recently developed textile industry, which has located here because of the nearness to raw materials, abundant labor, and plentiful power. In 1937, the 12 electric power plants located here (7 hydroelectric and 5 steam) had a total capacity of 95,000 kilowatts and a total output for the year of about 340 million kilowatt-hours.

Approximately four-fifths of all the land is in farms, according to the special Census of Agriculture of 1935. The total farm area of 5 million acres, however, is made up of 2 million acres of farm woodlands and 3 million acres of cropland, pasture, and other farm land. The corn acreage in 1934 was more than 836,000 acres with an average yield of about 10 bushels per acre; while the 618,000 acres of cotton averaged slightly less than half a bale to the acre. The corn yields per acre are poor compared with the average for the United States, but the cotton yields are somewhat better than the average for the entire cotton belt.

The proportion of land available for crops (cropland and plowable pasture) in the different counties is shown in figure 2, based on data from the 1935 Census. Most of the land not available for crops is forested.

From 1920 to 1935 the total land in farms showed little change, although the area in farm woodlands increased about 20 percent. More significant, however, is the fact that the acreage in cotton—the area's chief cash crop—declined from 1,461,000 acres in 1919 to 618,000 acres in 1934, a loss of more than one-half; and, unfortunately, there has not been a compensatory gain in

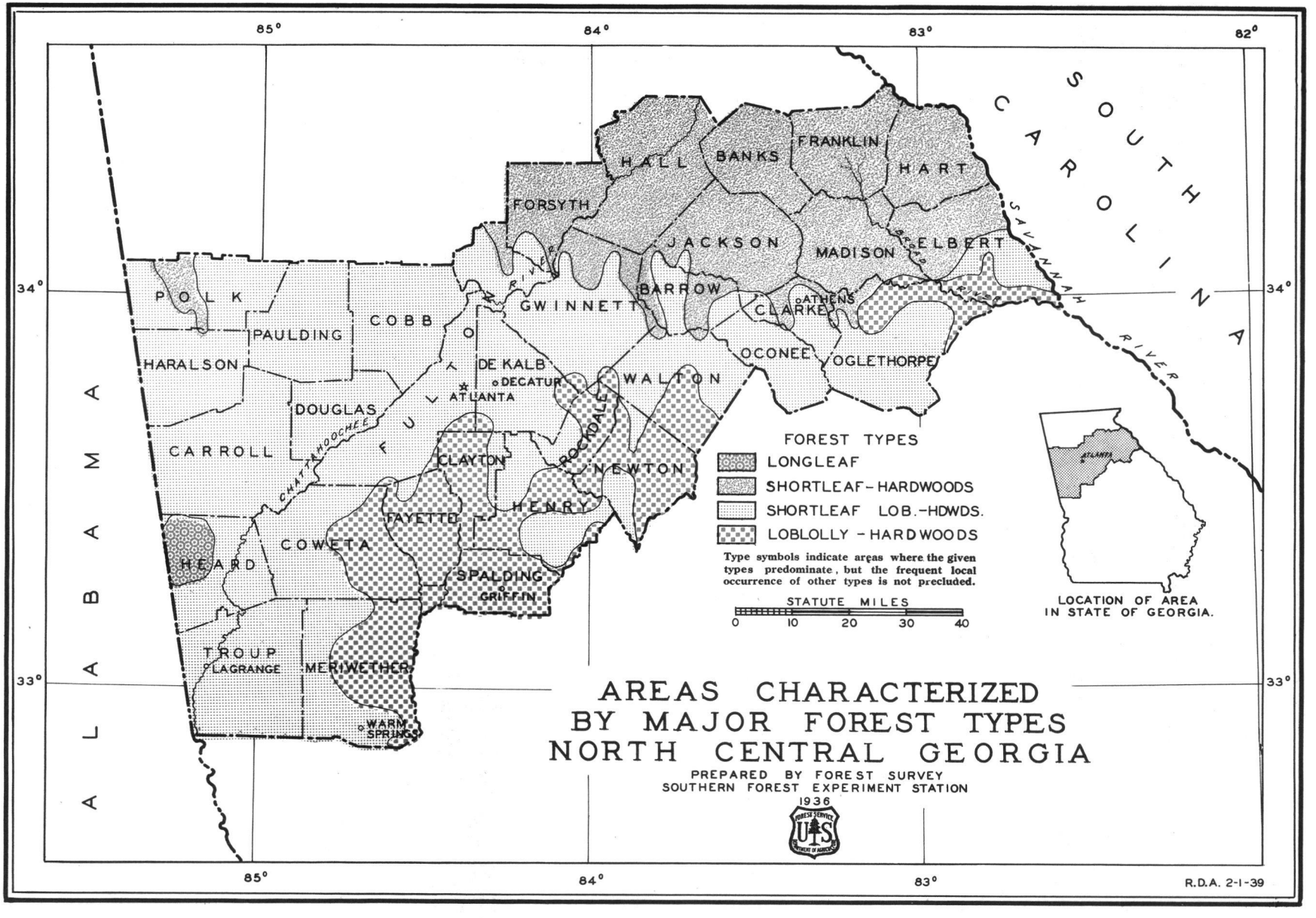

FIGURE 1.- FOREST TYPE MAP.

the acreage of corn, oats, hay, peaches, or other agricultural crops. From an employment standpoint, the decline in cotton production is serious, for cotton requires several times as much labor per acre as corn, the other principal crop in the area.

In 1935, the Census of Agriculture listed in the counties making up north central Georgia 70,700 separate farms, a farm being defined as "all the land which is directly farmed by one person, either by his labor alone or with the assistance of members of his household, or hired employees." In the aggregate, these farms make up 5,121,000 acres, or 81 percent of the entire area. The average size of the farms was 72 acres, of which approximately 28 acres was in woodland. A wide variation in the size of the farms is apparent; although 77 percent of the total number of farms had less than 100 acres each, these small farms included only 46 percent of the total farm acreage (table 2). The extent of the relatively large holdings is clearly indicated by the fact that while only 23 percent of the farms had 100 acres or more each, they included 54 percent of the total farm area.

Table 2. - Number and acreage of farms classified according to size, 1935

Size	Number of farms	Proportion of total number	Total area	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	31,631	44.8	828,418	16.2
50 - 99	22,860	32.3	1,526,525	29.8
100 - 499	15,834	22.4	2,453,801	47.9
500 - 999	313	.4	199,685	3.9
1,000 and over	75	.1	112,516	2.2
Total	70,713	100.0	5,120,945	100.0

As for the remaining 1¼ million acres not in farms, no ownership data are available; but for the lower Piedmont part of the area, Hartman and Wooten[1/] list as important land-owning groups (in addition to farmers) administrators and executors, banks and mortgage companies, merchants, and professional men.

The following description of the soils is given by the authorities mentioned above: "The most extensive soils in this region [upper Piedmont] are the sandy loam and clay loam of the Cecil series. Both have red clay subsoils. The sandy loam commonly occupies smoother lands where erosion has not removed the surface material, while the clay loam occupies more sloping sites and represents areas from which the sandy loam surface has been removed by erosion. Both these soils, except where the slopes are too steep, are fairly productive. Important causes of farm-land abandonment in this section are erosion and depletion of the soil by continuous cropping, with a consequent

1/ Hartman, W. A., and Wooten, H. H. Georgia land use problems. Georgia Expt. Sta. Bull. 191. 195 pages, illus., 1935.

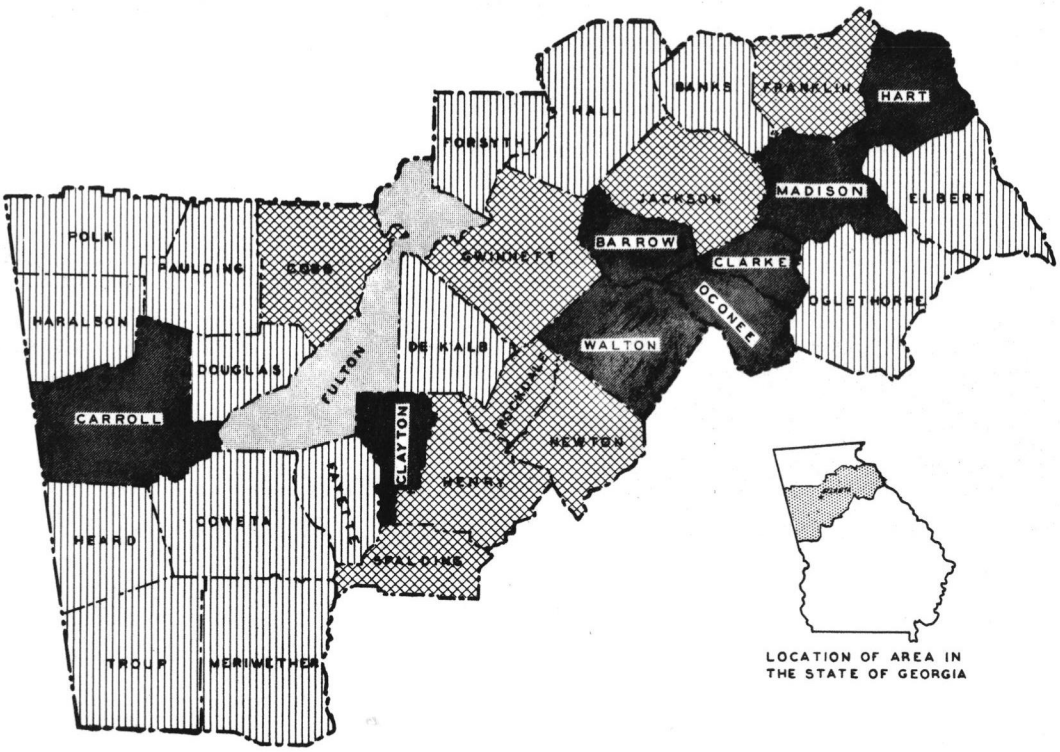

FIGURE 2.— PROPORTION OF COUNTY IN LAND AVAILABLE FOR CROPS.

0 - 29.9% 30.0 - 39.9% 40.0 - 49.9% 50.0% & OVER

reduction in yields." In regard to the lower Piedmont these authorities say: "An exploitative system of farming by reason of which erosion took heavy toll is a principal cause of the serious decline [in agriculture]. The clay loam soils require later planting of cotton than the lighter soils, and on this account the cotton crop is very susceptible to boll weevil injury."

In some form and to some degree, erosion is occurring almost everywhere in the area, but the field men of the Forest Survey recorded only the following well-marked and destructive stages: (1) sheet erosion, where the soil is washing off from a generally smooth surface; (2) shoestring erosion, where the soil surface is cut into and a system of small, branching gullies a few inches to 2 feet deep is formed; (3) gully erosion, where the soil surface is being destroyed by deep gully systems. Marked erosion, in one or more of these three forms (table 3) is found on 58 percent of the abandoned cropland, 50 percent of the idle cropland, 30 percent of the cropland in cultivation, and 27 percent of the pasture, but on only 18 percent of the forest, even though the forest is generally located on the steepest slopes. Furthermore, in many places accelerated erosion on forest land is caused by run-off from cultivated fields higher up the slope. Also erosion often is found continuing in a forest newly established on an eroded, abandoned field. The common farming practice is to allow the land to pass through a cycle of use-stages: Starting with the natural forest, areas are cleared and cultivated or pastured until erosion becomes serious, when they are abandoned; these areas again reforest in time by natural means, but until grasses or trees are established, marked erosion continues unless check dams or other artificial measures to control run-off are constructed.

Table 3. - Correlation of land use with erosion

Land use	Form of erosion				Total
	None or arrested	Sheet	Shoestring	Gullies	
	- - - - - - - - - - - - - - - - Acres- - - - - - - - - - - - - - - -				
Forest	2,096,700	152,900	153,700	148,100	2,551,400
Cropland in cultivation	1,932,100	621,300	191,800	26,900	2,772,100
Idle cropland	157,900	89,500	52,900	13,800	314,100
Abandoned cropland	112,000	58,400	53,600	40,600	264,600
Pasture	180,100	34,100	20,300	13,000	247,500
Total	4,478,800	956,200	472,300	242,400	6,149,700
Percent of total	72.9	15.5	7.7	3.9	100.0

Forest Description

The forest as a whole is made up of thousands of relatively small and scattered tracts, which in the aggregate cover 2½ million acres. Over 99 percent of the forest is privately owned; less than 1 percent is in public ownership.

The species-groups that compose the various type-groups are shown in figure 3, in which the cubic volume (including bark) of the species-groups is expressed as a proportion of the total volume in the type-group. The species-groups consist of the following: (1) pines--about half loblolly pine and half shortleaf pine, including a small volume of other pines--and cedar; (2) red, black, and tupelo gums, yellow poplar, and other pulping hardwoods; (3) oaks, including scrub oak; and (4) hickories, elms, sycamore, ash, etc. The pine and pine-hardwood type-groups, which cover 80 percent of the forest area, are found principally on the rolling uplands. Upland hardwood types cover 14 percent of the forest area; while the bottom-land hardwood types (located in the branch heads, river bottoms, and swamps) are found on 6 percent of the forest area. Almost 92 percent of all the forest land is in the rolling uplands; the remaining 8 percent is in branch heads, river bottoms, and swamps. The map (fig. 1) shows in a general way the range of certain forest types over large areas, although within the broad range limits are intermingled many small areas of other types as well as non-forest land.

Only 127,400 acres of old growth are left, mainly in small scattered tracts; three-fifths of this area--since 10 percent or more of the sawlog-size trees have been removed--is classed as partly cut (table 4). The smallest trees considered as saw timber by the Survey are: pines, 9.0 inches d.b.h. (diameter at breast height, 4½ feet above the ground); and hardwoods,

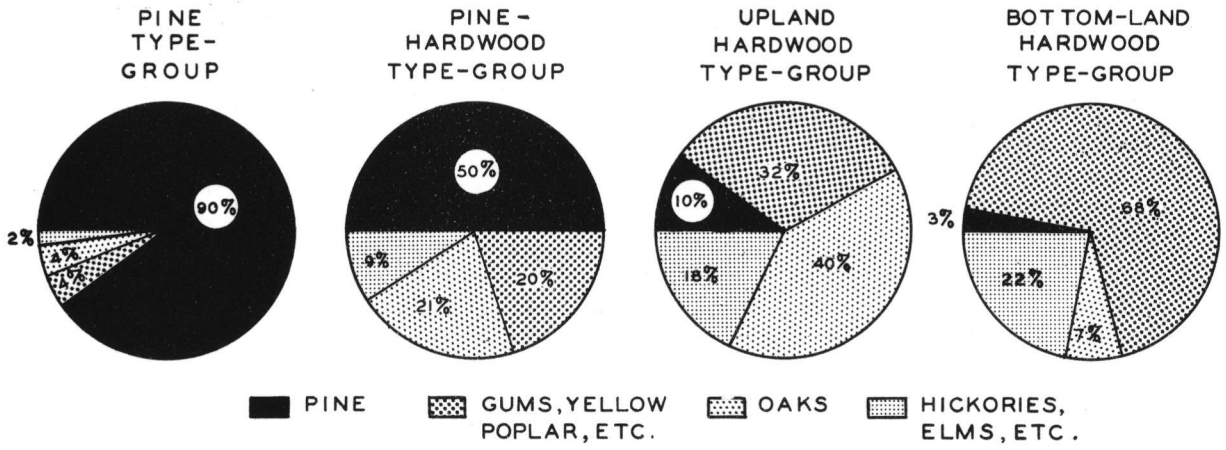

FIGURE 3.- SPECIES COMPOSITION OF FOREST TYPE-GROUPS.

13.0 inches d.b.h. The uncut old-growth stands average 7,200 board feet (green lumber tally) per acre, and the partly cut stands, 4,300 board feet. Approximately 41 percent of the old growth is in the pine and pine-hardwood types, 42 percent in upland hardwoods, and 17 percent in the bottom-land hardwoods.

Table 4. - Forest area classified according to forest condition and forest type-group

Forest condition	Pines	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	Total all types	Proportion of total
			Acres			Percent
Old growth:						
Uncut	13,000	7,300	16,200	13,800	50,300	2.0
Partly cut	22,700	8,900	37,400	8,100	77,100	3.0
Total	35,700	16,200	53,600	21,900	127,400	5.0
Second growth:						
Sawlog size:						
Uncut	546,100	120,900	76,300	54,400	797,700	31.3
Partly cut	280,800	86,800	63,300	6,500	437,400	17.2
Under sawlog size	577,800	282,500	148,400	75,500	1,084,200	42.5
Reproduction 1/	54,400	34,100	11,400	2,400	102,300	4.0
Total	1,459,100	524,300	299,400	138,800	2,421,600	95.0
Total all conditions	1,494,800	540,500	353,000	160,700	2,549,000	100.0
Percent of total forest area	58.7	21.2	13.8	6.3	100.0	

1/ Includes 4,100 acres of clear-cut condition in the pine type.

The second-growth stands, covering almost 2½ million acres, or 95 percent of the forest area, occur in both large and small tracts throughout the area and in all forest type-groups, although mainly in the pine and pine-hardwood types. Well advanced in size are the second-growth sawlog-size stands, which have, if uncut, an average volume of 4,900 board feet per acre, or if partly cut, an average of 3,100 board feet per acre. The most important of all conditions, from the standpoint of area, is the under-sawlog-size second growth, in which the characteristic pines are less than 9 inches d.b.h. and the characteristic hardwoods are less than 13 inches d.b.h.

"Reproduction" is the term applied to the youngest forest condition; seedlings and sprouts less than 1.0 inch d.b.h. and occurring at the rate of 80 or more per acre form the principal forest cover. Over four-fifths of the reproduction area is in the combined pine and pine-hardwood type-groups. All the important native species are prolific seeders, and the new forest usually has the same species pattern as the old. The clear-cut forest area is so small that it is included in the table with the figures for the reproduction area.

The site quality or productivity of the forest as indicated by the site index, i.e., the height in feet of average dominant trees at 50 years, compares favorably with that of other Forest Survey units in the South. About 31 percent of the sites dominated by loblolly pine have an index of 80 feet or better; 52 percent, 70; and 17 percent, 60 or less. Of the sites dominated by shortleaf pine, 2 percent have a site index of 80 or over; 18 percent, 70; 52 percent, 60; and 28 percent, 50 or less.

In the field work on each of the forest sample plots, the age of the predominating stand was determined, and, for cases in which more than one age-class was found on the same area, the age-class recorded was that of the trees that in the judgement of the cruiser would provide the next cut. As shown in figure 4, 48 percent of the pine and pine-hardwood type-areas is in the 0- to 30-year age-classes; 39 percent in the 31-60, and only 13 percent is in stands at least 61 years old. This deficiency in area of the older stands (i.e., stands 61 years old and over) is an obvious weakness of the north central Georgia forests. Prevailing forest volumes, or the average gross volume per acre in cubic feet, inside bark, of growing-stock trees (5.0 inches d.b.h. and larger), increases from practically nothing for the 0- to 10-year age-class to slightly over 1,000 cu. ft. per acre for the 31- to 40-year age-class and to about 1,700 cu. ft. for the oldest stands (i.e., stands 71 years old and over). These yields, however, are only a fraction of the productive capacity of the sites, as shown by the volumes of well-stocked stands actually growing on the area. The heaviest stocked 10 percent of the plots adjusted to a weighted-average site, is shown by the dotted, curved line. For example, well-stocked stands 31 to 40 years old have about 2,000 to 2,600 cubic feet per acre and at 70 years about 3,200 cubic feet. This comparison indicates a striking need and opportunity for building up the growing stock, without which full use of the soil and optimum harvests cannot be attained.

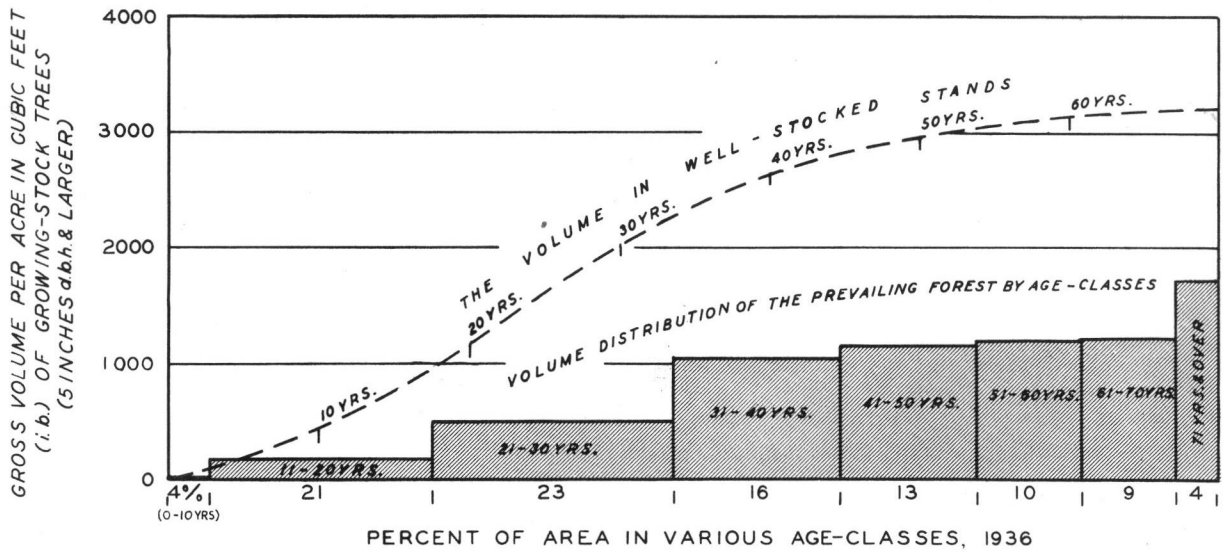

FIGURE 4.- **DISTRIBUTION OF PREVAILING AGE-CLASSES AND VOLUME, AND THE VOLUME IN WELL-STOCKED STANDS** (BASED ON THE PINE AND PINE-HARDWOOD TYPE AREAS* OF 1,962,300 ACRES).

*EXCLUDING THE LONGLEAF AND SLASH PINE TYPES.

Figure 5 shows the total number of pines and hardwoods by 2-inch diameter-classes (the 2-inch class ranges from 1.0 to 2.9 inches; the 4-inch, from 3.0 to 4.9 inches, etc.). The "pulping hardwoods" include yellow poplar, the gums, maples, willows, bay, and basswood; while the "non-pulping hardwoods" (species not commonly pulped at present but which, in the future, may be found suitable) include the oaks, hickories, ashes, and other hardwoods. This chart indicates that more than three-fourths of all the trees are in the 2- and 4-inch classes. These small trees would greatly augment the volume in the large-tree portion of the growing stock within the next 2 or 3 decades if any large proportion of them survived. This emphasizes the urgent need for protection from fire, without which this well-established basis for future forest yields easily may be lost.

The number of growing-stock trees 13.0 inches d.b.h. and larger is relatively small, owing to the common practice of taking out the largest and most valuable trees at each logging operation. Since high-quality lumber and veneer stumpage is found chiefly in larger trees, forest landowners should endeavor to increase the number of these trees. In place of the old "cut-any-tree-that-has-a-value" method, selective logging practices, designed to bring about a good distribution of the growing stock and to leave the stand as a whole in a healthy and rapidly growing condition, should be adopted. Cuttings adjusted to the sustained-yield productivity of the forest should be made in all suitable size-classes and as frequently as economic conditions and the rate of growth will permit.

Estimates of Timber Volume

Saw-timber volume

To be classed as saw timber by the Forest Survey, a tree must be living. Also, if pine, it must be at least 9.0 inches d.b.h. outside bark, or if hardwood, 13.0 inches; and it either must have at least 50 percent of its gross volume in sound material or contain at least one sound 12-foot butt log. This area contains more than 6 billion board feet, as measured by the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally, or less than 4 billion board feet according to the Doyle rule, the measure used locally (table 5). The volume figures given are net, in that allowance has been made for woods cull caused by rot, fire-scar, crook, limbiness, etc., as well as for loss in manufacture due to sweep and hidden defects. A flexible top-diameter limit, depending upon merchantability, is used; no pine logs less than $5\frac{1}{2}$ inches in diameter inside bark at the small end are included, and likewise no hardwood logs less than $8\frac{1}{2}$ inches. The average top diameters actually used, however, considerably exceed these minima.

Table 5. - Net board-foot volume expressed in green lumber tally (based on the International $\frac{1}{4}$-inch rule) and in Doyle scale, 1936

Species	Green lumber tally	Doyle scale
	M board feet	
Loblolly pine	2,522,200	1,567,800
Shortleaf pine	2,108,600	1,130,000
Longleaf and other pines	190,900	115,000
Yellow poplar	357,300	260,300
White oaks	221,000	159,900
Red oaks	207,200	147,700
Red gum	185,700	130,000
Black and tupelo gums	98,900	67,900
Ash	30,200	20,000
Other hardwoods	253,900	173,900
Total all species	6,175,900	3,772,500

Pines, principally loblolly and shortleaf, make up over three-fourths of the green-lumber volume; hardwoods, with yellow poplar, oaks, gums, ashes, and other species, include less than one-fourth. Grouped together as "other hardwoods" are the hickories, maples, birches, elms, sycamore, basswood, and other hardwoods of minor volume. For all species combined, old-growth stands—uncut and partly cut together—make up 11 percent of the total volume; sawlog-size second growth, 85 percent; and under-sawlog-size second growth, 4 percent. The volume in the old-growth conditions is fairly evenly divided between pines and hardwoods, whereas the volume in the second growth is mostly pine (table 6).

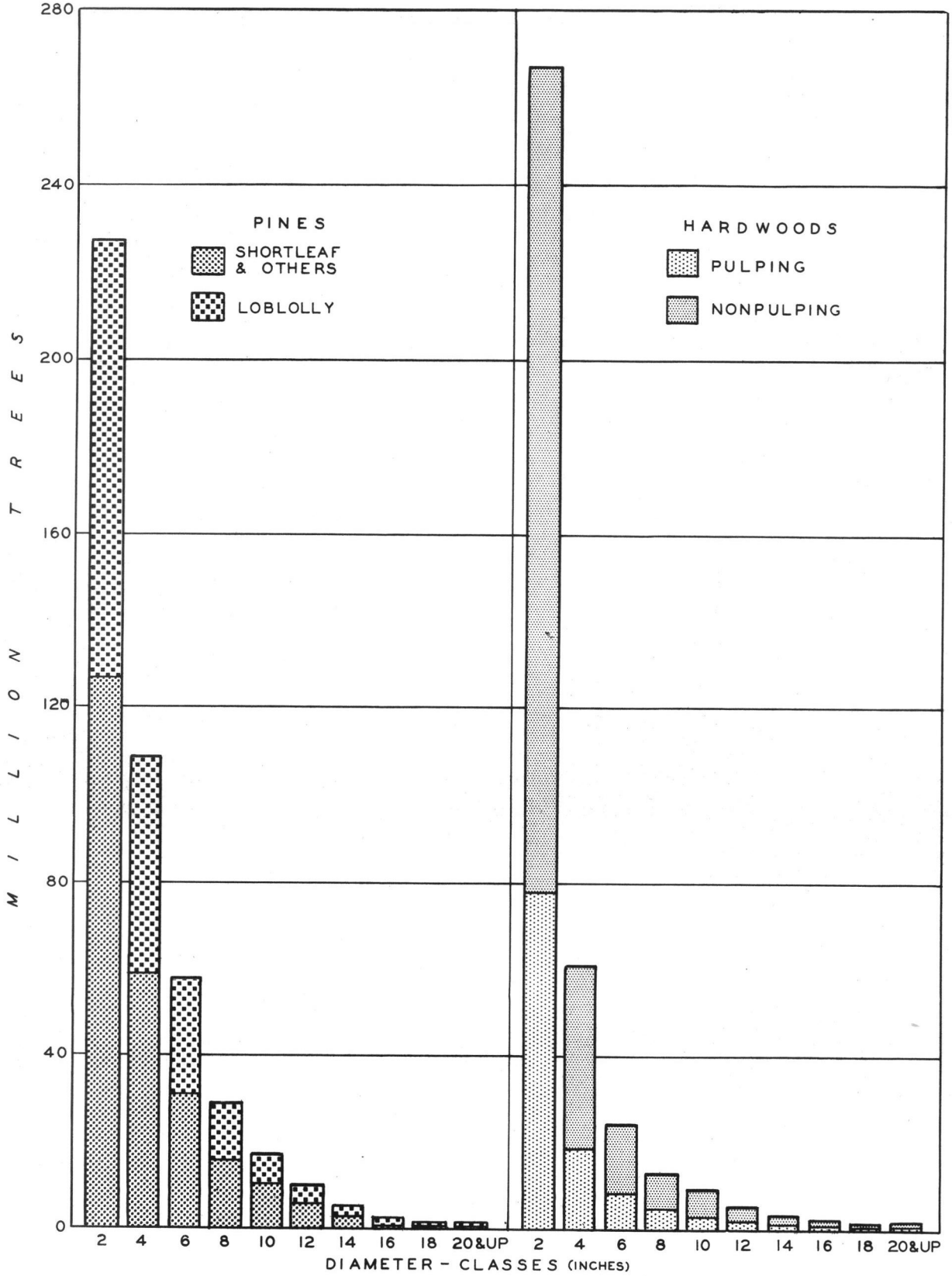

FIGURE 5 - STAND DIAGRAMS.

Table 6. - Net board-foot volume (green lumber tally based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1936

Tree species-groups	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size		Under sawlog size 1/		
			Uncut	Partly cut			
	Thousand board feet						
Pines:							
Loblolly	113,900	63,300	1,718,700	524,500	101,800	2,522,200	40.9
Shortleaf	75,000	68,700	1,343,900	539,100	81,900	2,108,600	34.1
Longleaf and other	6,700	39,500	101,400	29,100	14,200	190,900	3.1
Total pines	195,600	171,500	3,164,000	1,092,700	197,900	4,821,700	78.1
Hardwoods:							
Yellow poplar	35,800	37,400	208,600	62,500	13,000	357,300	5.8
Red gum	22,800	12,800	112,200	34,000	3,900	185,700	3.0
Black and tupelo gums	12,500	13,800	59,200	10,000	3,400	98,900	1.6
Red oaks	18,800	29,700	98,600	50,700	9,400	207,200	3.3
White oaks	35,200	31,900	94,800	51,000	8,100	221,000	3.6
Other hardwoods	43,600	32,700	151,500	41,400	14,900	284,100	4.6
Total hardwoods	168,700	158,300	724,900	249,600	52,700	1,354,200	21.9
Total all species	364,300	329,800	3,888,900	1,342,300	250,600	6,175,900	100.0
Percent of total	5.9	5.3	63.0	21.7	4.1	100.0	

1/ Includes the reproduction and clear-cut conditions.

It is noteworthy that much of the saw timber is in trees considered rather small for the manufacture of lumber and veneer. Small pine saw-timber trees (i.e., trees in the 10- and 12-inch d.b.h.-classes) make up 42 percent of the pine volume; while small hardwood trees (i.e., trees in the 14-, 16-, and 18-inch d.b.h.-classes) make up 63 percent of the hardwood volume (table 7).

The volume density per acre greatly influences the economic value of the stands, owing to the fact that logging costs per thousand board feet generally decrease as the volume per acre increases. Proportional area and volume of the sawlog-size conditions are classified in figure 6, Charts A and B, according to gross saw-timber volume per acre (no deductions being made for cull). Considering all the saw-timber stands of pine and pine-hardwood type-groups combined, approximately 73 percent of the area and 93 percent of the saw-timber volume are in stands having at least 2,000 board feet per acre; it follows that 27 percent of the area and only 7 percent of the volume are in stands having less than 2,000 board feet. As shown by the charts, there is a

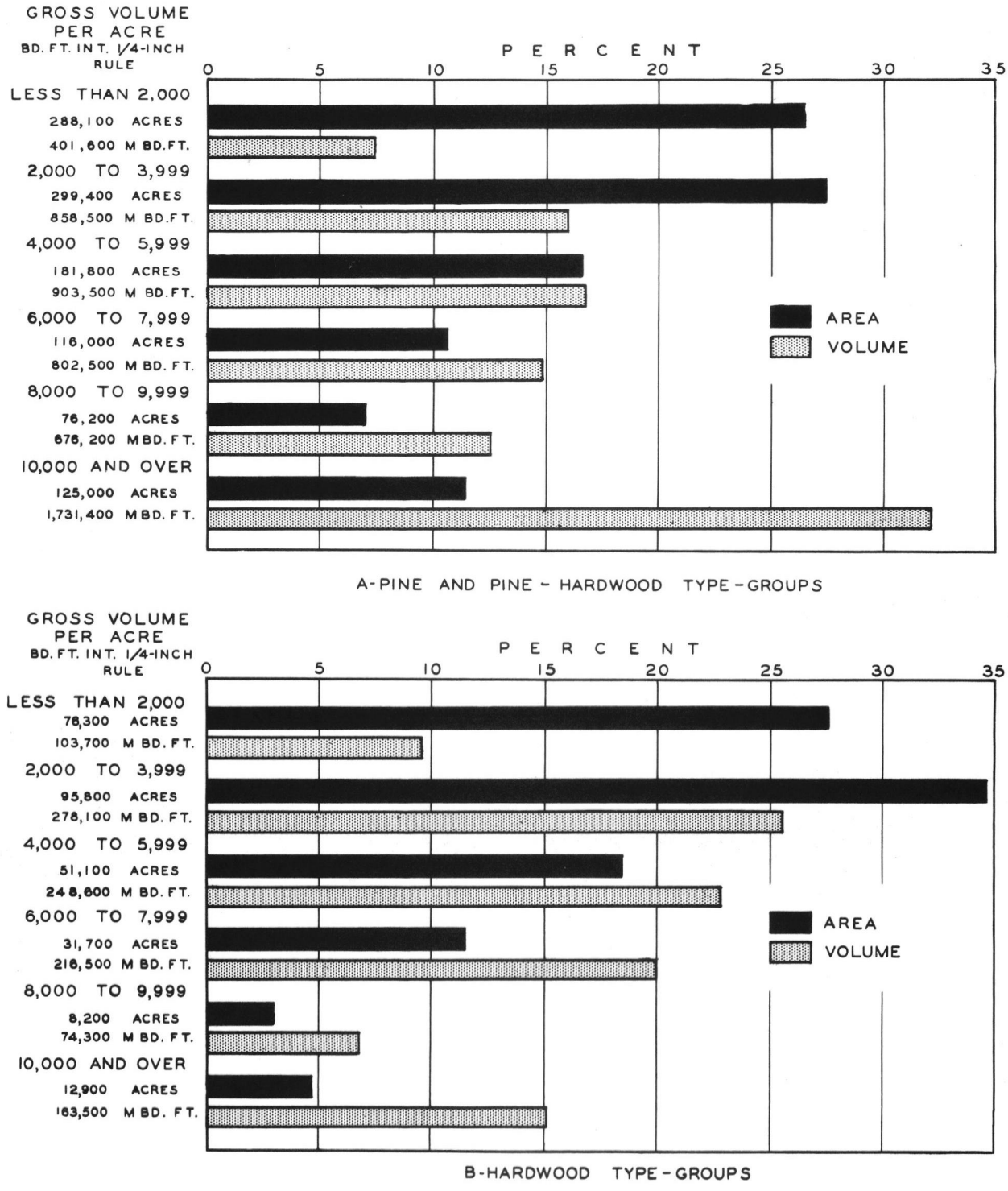

FIGURE 6. - PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME PER ACRE.

slightly greater representation of stands of 2,000 board feet and over per acre in the pine and pine-hardwood type-groups than in the hardwoods. Although the topography of much of the forest land in the northernmost tier of counties is rough, about 98 percent of the entire forest area of north central Georgia has been cut over at least once, and only a small part of the remaining uncut area can be classed as so inaccessible that commercial logging operations are impracticable.

Table 7. - Diameter distribution of net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions

Species-groups and diameter-classes (in inches)	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size		Under sawlog size 1/		
			Uncut	Partly cut			
	Thousand board feet						
Pines:							
10 - 12	26,500	29,400	1,330,500	476,600	168,200	2,031,200	42.1
14 - 16	49,500	45,800	1,088,700	380,100	20,400	1,584,500	32.9
18 - 20	40,800	46,100	512,300	171,000	5,700	775,900	16.1
22 - 28	67,500	45,700	216,500	62,000	3,600	395,300	8.2
30 and over	11,300	4,500	16,000	3,000	-	34,800	.7
Total pines	195,600	171,500	3,164,000	1,092,700	197,900	4,821,700	100.0
Hardwoods:							
14 - 18	88,300	69,200	460,500	183,400	47,700	849,100	62.7
20 - 28	70,000	74,000	248,800	66,200	5,000	464,000	34.3
30 and over	10,400	15,100	15,600	-	-	41,100	3.0
Total hdwds	168,700	158,300	724,900	249,600	52,700	1,354,200	100.0

1/ Includes the reproduction and clear-cut conditions.

In north central Georgia so much of the saw-timber volume is in trees too widely spaced to grow high-quality sawlogs that the Forest Survey made a supplemental study and classified the pine saw-timber trees as "smooth," "limby," and "rough." Table 8 shows that 47 percent of the pine saw-timber volume is in smooth trees, 47 percent is in limby trees, and 6 percent is in rough trees. As a general rule, pine trees in the old-growth stands are far superior in saw-timber quality to those in open-grown second-growth stands, many of which are "old field."

Table 8. - Classification of pines according to saw-timber quality 1/
(based on supplemental data)

Species and stand condition	Tree grade			
	Smooth	Limby	Rough	Total
	Percent of volume			
Loblolly pine:				
Old growth	92	8	-	100
Second growth	33	60	7	100
Weighted average	37	57	6	100
Shortleaf pine:				
Old growth	91	9	-	100
Second growth	54	41	5	100
Weighted average	56	39	5	100
All pines (including longleaf and others):				
Old growth	92	8	-	100
Second growth	44	50	6	100
Weighted average	47	47	6	100

1/ Smooth trees have 20 feet or more of clear length and also at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 feet of clear length and 30 to 49 percent of total usable length practically free of limbs and indications of knots; rough trees have less than 12 feet of clear length, or less than 30 percent of total usable length practically free of limbs and knots.

Cordwood volume

The entire net usable volume of all live trees 5.0 inches d.b.h. and larger, including the saw-timber volume shown previously, amounts to over 31 million standard cords (4 x 4 x 8 feet) with bark included (table 9). Deductions for non-usable volume include only defects that cause the material to be unsuited for use as cordwood; therefore, deductions for sweep and slight crook are not made. "Upper stems of saw-timber trees" include the cordwood above the sawlog portion up to a flexible top-diameter limit, varying with the quality, but not less than 4 inches. For hardwoods, the usable limbs are included, while for pine the upper stems (but no limbs) are included. "Sound trees under sawlog size" include the full stem (without limbs) of pine trees 5.0 to 8.9 inches d.b.h. and of hardwoods 5.0 to 12.9 inches d.b.h. up to a variable top-diameter limit but never less than 4 inches. In the fourth column, under "sound and rotten cull trees," is given the usable volume that may be salvaged if undesirable cull trees 5.0 inches d.b.h. and larger are utilized.

Table 9. - Net volume in various classes of sound material, 1936

Species-group	Sound trees saw-log size	Upper stems of sawlog-size trees	Sound trees under saw-log size	Sound and rotten cull trees 1/	Total all classes	Proportion of total
	Cords (bark included)					Percent
Pines	10,402,500	1,513,200	5,139,500	638,400	17,693,600	56.4
Hardwoods:						
Pulping	1,892,900	1,067,400	2,171,800	1,310,800	6,442,900	20.5
Nonpulping	1,589,900	888,200	2,980,700	1,776,300	7,235,100	23.1
Total hardwoods	3,482,800	1,955,600	5,152,500	3,087,100	13,678,000	43.6
Total all species	13,885,300	3,468,800	10,292,000	3,725,500	31,371,600	100.0
Percent of total	44.2	11.1	32.8	11.9	100.0	

1/ Includes all scrub oaks.

About 56 percent of all the cordwood is in pines; 21 percent is in pulping hardwoods (gums, yellow poplar, basswood, etc.); and 23 percent is in "nonpulping" hardwoods (oaks, hickories, ash, etc.). It should be recognized, however, that future development in pulp- and paper-making technique may facilitate the pulping of species now considered unsuitable for this purpose.

Figure 7 gives the cordwood volume in sound trees only, including the upper stems of pine and upper stems and usable limbs of hardwoods. From the standpoint of the future of the forest, it is significant that over half the cordwood volume in sound trees is in the 6-, 8-, 10-, and 12-inch diameter-classes. If large trees suitable for high-quality lumber and veneer are to be grown, some of the highest-quality small trees must be reserved for this purpose, in spite of the fact that trees less than 13 inches d.b.h. are usable for pulpwood. At prevailing stumpage rates for pulpwood, poles, and saw timber, it can be demonstrated that it will pay the average timber owner to hold a portion of his younger trees to grow into sizes that will produce poles or sawlogs. This practice should allow the cutting of pine for pulpwood, fuel wood, and other low-priced commodities as intermediate yields.

Although the total usable cordwood volume is over 31 million cords, the growing stock is less than 26 million cords, because this growing-stock material, for which increment is computed, does not include either the cull trees or the tops and limbs of hardwoods. Cull trees have a usable volume of 3-3/4 million cords, of which slightly more than half is in pulping species. The cordwood in cull pines alone—the main species now used in the South for pulpwood—amounts to almost two-thirds of a million cords. Although the removal of these cull trees would leave the forest in a healthier and faster-growing condition and give additional space for the establishment of seedlings,

additional markets for cordwood material are essential before the forest landowners can dispose of these trees without taking a loss.

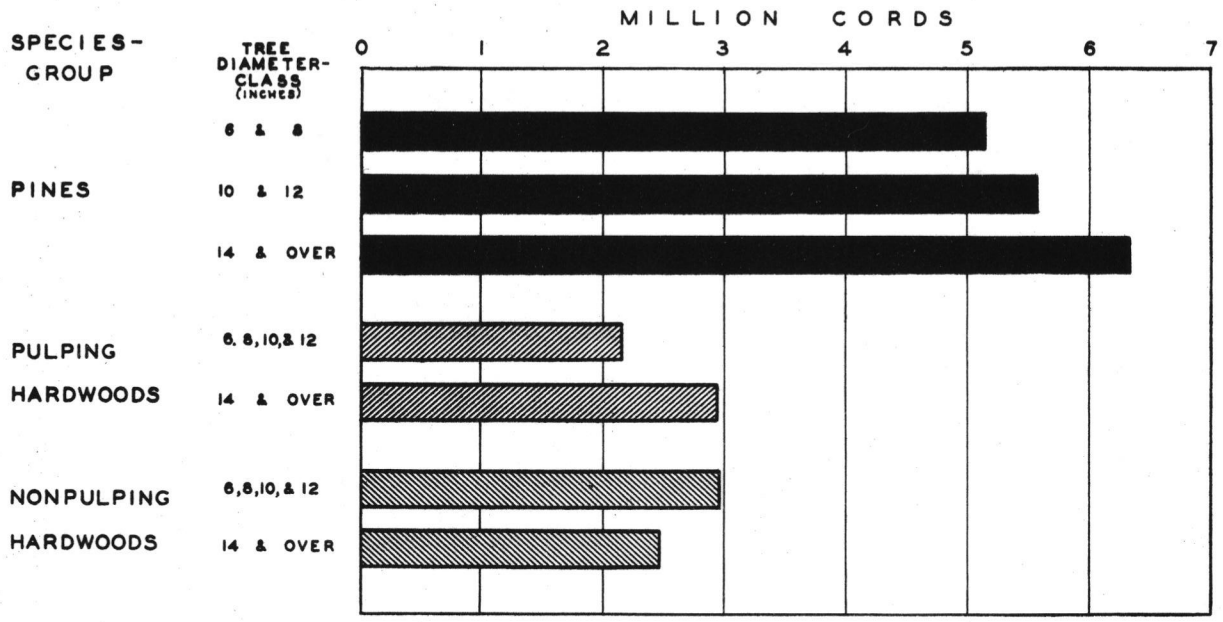

FIGURE 7.- CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

Average volumes per acre in cords of growing-stock material (computed by dividing volumes by corresponding forest area) are shown in table 10. The weighted average per acre for all forest conditions and type-groups is approximately 10 cords, which is about the average for the entire State.

Table 10. - Average cordwood volume per acre in sound trees, including bark, 1936

Type-group	Old growth		Second growth			All conditions 1/
	Uncut	Partly cut	Sawlog size		Under sawlog size	
			Uncut	Partly cut		
	Cords per acre					
Pine	29.7	16.2	19.0	11.5	3.7	11.0
Pine-hardwood	32.1	16.4	16.0	11.4	3.2	7.8
Upland hardwood	16.8	12.9	14.4	10.7	3.2	8.5
Bottom-land hardwood	25.0	13.5	20.3	16.3	4.9	12.6
All types (weighted average)	24.6	14.3	18.2	11.4	3.5	10.1

1/ Includes areas of reproduction and clear-cut conditions.

Poles and piles

Poles and piles are considered in a separate inventory of trees that could be used for these generally high-priced products. It should be noted, however, that these trees also were included in the saw-timber and cordwood inventories, because it is obvious that some of them will be used for lumber, posts, or other products. According to a conservative estimate, based upon the specifications of the American Standards Association, there were in 1936 over 7 million pine trees suitable for poles and piles (table 11). More than half of these trees were less than 11 inches d.b.h. and under 30 feet long.

Table 11. - Total number of pine poles or piles, classified according to length and diameter, 1936

D.B.H. of trees (outside bark)	Pole or pile length (feet)						Total	Proportion of total
	20	25	30	35	40	45 and over		
Inches	Thousand pieces							Percent
7.0 - 8.9	1,610	588	137	68	-	-	2,403	33.1
9.0 - 10.9	1,042	639	383	124	58	-	2,246	31.0
11.0 - 12.9	445	315	483	130	107	68	1,548	21.4
13.0 - 14.9	110	101	243	110	107	98	769	10.6
15.0 - 18.9	-	42	88	45	46	61	282	3.9
Total	3,207	1,685	1,334	477	318	227	7,248	100.0
Percent of total	44.2	23.3	18.4	6.6	4.4	3.1	100.0	

Forest Increment

The net annual forest increment is the volume added by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes during the year and minus the losses due to mortality. This net increment of the forest represents, in a general way, the amount that could be removed annually without depleting the volume of the growing stock.

In 1936, the gross growth amounted to almost 502 million board feet, green lumber tally, and the mortality was 49 million board feet, leaving a net increment of 453 million board feet before making deductions for commodity drain. Less than 4 percent of the net increment of saw-timber material occurred in old-growth stands; 69 percent in sawlog-size second-growth stands; and 27 percent in under-sawlog-size second-growth stands (table 12). Considering all forest conditions combined, pines make up over four-fifths of the net saw-timber increment and hardwoods less than one-fifth. In 1936, the net increment for all growing-stock material of trees 5 inches d.b.h. and larger, not including upper stems and limbs of sawlog-size hardwoods or culls, amounted to over 119 million

cubic feet, bark excluded. The net increment of all growing-stock material amounted to more than 1½ million cords of rough wood, bark included, of which 1,183,000 cords were pine and 468,900 cords were hardwoods (table 13). It is estimated that of the hardwood increment approximately half was in pulping species.

Table 12. - Net increment in board feet and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet (green lumber tally) -			- Thousand cubic feet (inside bark) -		
Old growth	3,800	13,700	17,500	830	3,490	4,320
Second growth:						
Sawlog size	249,500	61,700	311,200	49,540	18,360	67,900
Under sawlog size[1/]	112,100	11,800	123,900	38,550	8,620	47,170
Total all conditions	365,400	87,200	452,600	88,920	30,470	119,390

1/ Includes a small amount in the reproduction and clear-cut conditions.

In 1936 the average net increment per acre in the area, assuming that the stands were not influenced by cutting, was higher than that in many parts of the South, although much less than it could have been under good forest management, which includes long-continued fire protection. For the entire

Table 13. - Net increment in cords in the various forest conditions, 1936

Forest condition	Pines	Hardwoods	Total	Percent of total
	- - - - - - Cords (bark included) - - - - - -			
Old growth	10,700	52,500	63,200	3.8
Second-growth, sawlog size	645,600	280,600	926,200	56.1
Second-growth, under sawlog size[1/]	526,700	135,800	662,500	40.1
Total	1,183,000	468,900	1,651,900	100.0

1/ Includes a small amount in the reproduction and clear-cut conditions.

forest, including reproduction and clear-cut areas, the average net increment per acre was 181 board feet of saw timber; or, for all growing-stock trees 5 inches d.b.h. and larger, two-thirds of a cord of rough wood, including bark (table 14). The greatest average growth occurred in the uncut, sawlog-size, second-growth condition with 321 board feet per acre of saw timber; or almost a full cord of all growing-stock material in trees 5 inches d.b.h. and larger.

Table 14. - Average increment per acre in 1936 in the various forest conditions (Uninfluenced by cutting)

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth	31	6.8	.09	110	27.7	.41	141	34.5	.50
Second growth:									
Sawlog size:									
Uncut	258	51.5	.67	63	17.0	.26	321	68.5	.93
Partly cut	114	22.5	.29	29	11.9	.18	143	34.4	.47
Under sawlog size	104	36.4	.50	11	8.2	.13	115	44.6	.63
Weighted averages all conditions 1/	146	35.9	.47	35	12.2	.19	181	48.1	.66

1/ Includes a small amount in the reproduction and clear-cut conditions.

Forest Industries

Lumber industry

During the period of greatest agricultural development (1800-1860), in the absence of suitable markets, most of the original timber was cut and burned to clear the land for fields; and until the World War, the wood-using industries in north central Georgia were relatively unimportant. A few small sawmills cut lumber almost entirely for the meager local demand. About 1914, however, the "roofer" industry moved southward from the Carolinas, and a swarm of little sawmills was attracted to the rapidly developing second-growth stands and to the remaining tracts of old-growth timber. Concentration yards with planing mills, generally located along the railroad lines, were set up, each yard having tributary to it a number of small or "peckerwood" sawmills cutting rough lumber. The high prices of the World War period and of the subsequent building era of the 1920's gave a great stimulus to lumber production, which probably was at a peak in this area between 1924 and 1929. The quality of the saw timber was relatively poor; but even poorer was the method of manufacture. All logs regardless of grade were sawed into 1-inch boards, commonly called "roofers," which, after being dried more or less, were planed and shipped ungraded to the northern markets.

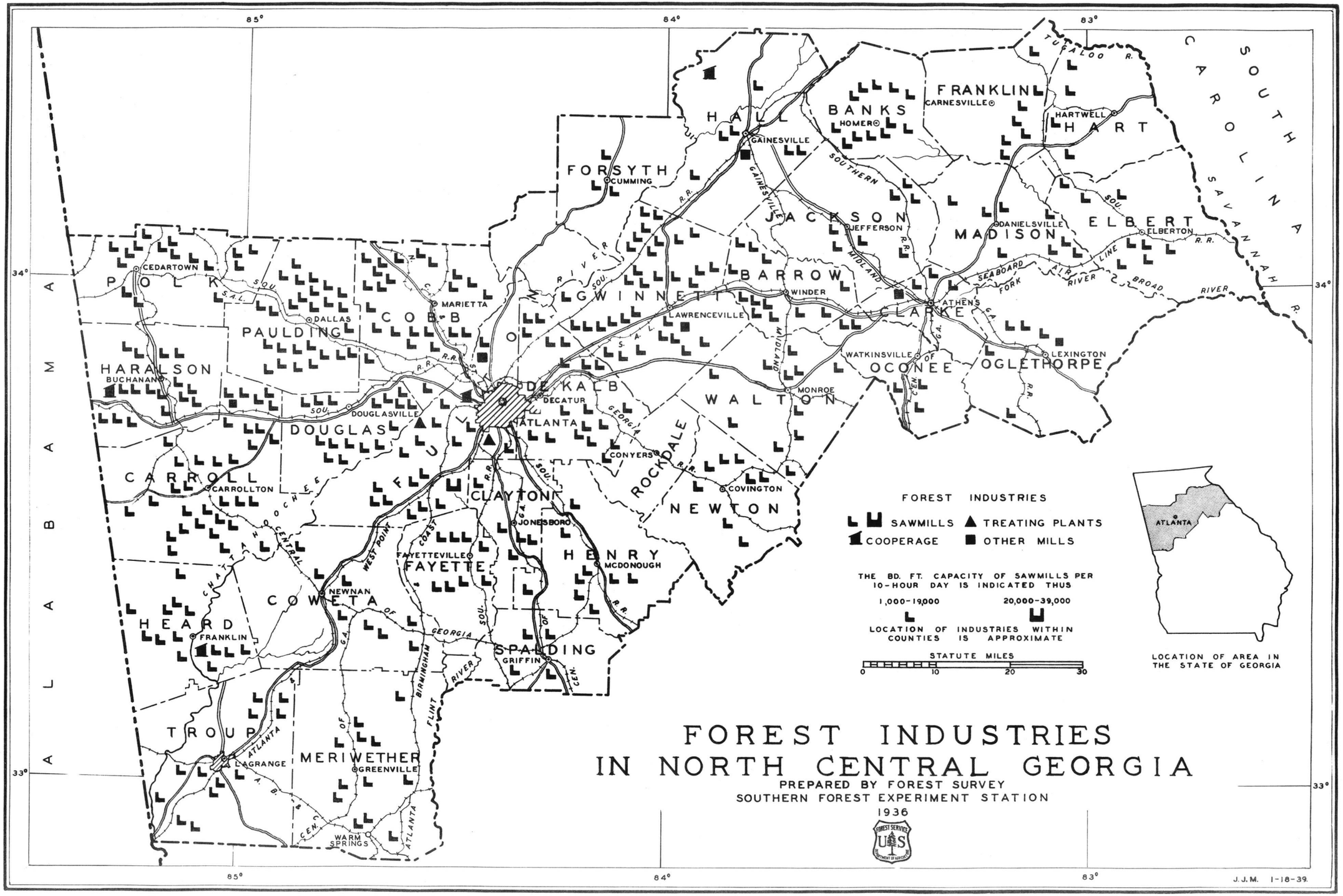

FIGURE 8. - FOREST INDUSTRIES MAP.

In 1936, in north central Georgia there were 369 sawmills, only one of which had a 10-hour cutting capacity of more than 20,000 board feet (fig. 8). Many of the mills still cut nothing but "roofers," although there is a growing tendency to diversify the lumber product (especially for the local demand) and to improve the manufacturing methods; these improved methods include dipping to prevent sap stain, more thorough drying, more careful remanufacturing, and grading. In 1936, regardless of whether the trees cut were within or without this area, the 369 sawmills produced 112 million board feet, or about 300,000 board feet per mill. This average production seems very small, but many of the mills are farmer-owned and are operated only a few days per year. Carroll, Gwinnett, and Fulton Counties each produced more than 8 million board feet of lumber in 1936. In 1936 all the sawmills combined provided, at both the plant and in the woods, a total of 338,000 man-days (10 hours each) of employment (table 15). It is estimated that at least 7,000 workers, with an average of almost 50 working days per year, were employed by the sawmills.

Table 15. - Wood-products production and employment, 1936

Product	Units produced or used	Employment		
		In woods	At plants	Total
		- Thousand man-days (10 hours each) -		
Lumber	112,000,000 board feet	118	220	338
Fence posts	4,039,000 pieces	50	-	50
Cross ties, poles, and piles	76,000 pieces	11	-	11
Fuel wood	1,191,700 cords	1,422	-	1,422
Cooperage and veneer 1/	10,300 cords	13	14	27
Miscellaneous (dimension stock, excelsior, treated products, 2/ etc.)	40,200 cords	12	40	52
Total		1,626	274	1,900

1/ For veneer, only woods labor for 11,500 cords of veneer bolts shipped to plants outside the unit is included.
2/ For the treated products only the labor at the plants is included.

Other forest industries

Four mills making cooperage stock and nine miscellaneous plants were in north central Georgie in 1936. Three of the four cooperage mills cut oak staves for "tight" cooperage, while the fourth cut pine heading for "slack" cooperage. The nine miscellaneous plants include two treating plants, both located at East Point (near Atlanta), where they creosoted pine poles, piles, cross ties, and lumber; three mills making dogwood shuttle blocks; one producing hickory handle blanks; one making baseball-bat stock; one manufacturing excelsior from peeled pine and yellow poplar cordwood; and one excelsior plant

not operating in 1936. (In addition, there are a few shingle mills, mostly small and cutting principally for local use; these are not shown in figure 8.) All nonlumber forest-products industries (not including fuel wood) furnished a total of 140,000 man-days, or employment for about 1,400 men, assuming an average of 100 working days per man.

From the standpoint of cubic-foot volume cut and man-days of labor involved, however, fuel wood is the most important forest product. Over 1 million cords of wood were cut for fuel, practically all of which came from farm woodlands and were used directly upon the farms; almost $1\frac{1}{2}$ million man-days (10 hours each) were used in cutting and hauling it.

The harvesting, transportation, and manufacture of forest products is generally a part-time occupation for the inhabitants of the area, and it is impossible to convert accurately the man-days of labor required into number of people actually employed. According to the 1935 Census of Agriculture, however, farmers worked for pay away from their own farms about 1 3/4 million man-days, and it is believed that much of this time was spent in the forest and in forest-products industries.

Commodity Drain from the Growing Stock

The total volume of wood removed in 1936 from the saw-timber part of the growing stock of this area for all industrial uses and for domestic purposes was the equivalent of 243 million board feet; while from all sound trees at least 5 inches d.b.h. were removed about 83 million cubic feet, inside bark (table 16), or over 1 million cords of wood including the bark. The commodity drain of saw timber, which is the total cut from saw-timber trees, includes (a) the logs, poles, ties, billets, and cords of wood cut from this class of timber for conversion within and without the area, and (b) the waste incidental to the various logging operations. Material cut and utilized from the cull trees and from dead trees is not included.

Of the drain from saw-timber material alone, approximately four fifths comes from pines, and one-fifth from hardwoods. The saw-timber drain occasioned by lumber is closely approximated by that utilized for fuel wood. To cut such a large volume of saw-timber stumpage for fuel wood, a low-priced commodity that could be cut from the great number of cull and dead trees, is a wasteful practice indeed.

A part of the total commodity drain against the sound-tree growing stock (i.e., the non-sawtimber material in trees under sawlog size and in upper stems of sawlog-size pine trees) is not measured in board feet. In 1936, this drain amounted to 44 million cubic feet, inside bark, or 618,000 cords of rough wood, outside bark. The total commodity drain from both the saw-timber and the non-sawtimber components of the growing stock was, as stated above, 83 million cubic feet, or over 1 million cords. In table 16 the total commodity drain is allocated to the commodities for which the trees were cut.

Table 16. - Commodity drain from the sound-tree growing stock, 1936

Reason for drain	From saw-timber material			From all growing-stock material
	Species-group		Total	
	Pines	Hardwoods		
	- - - - Thousand board feet (green lumber tally)			Thousand Cubic feet (i.b.)
Lumber	104,000	11,700	115,700	19,610
Cross ties, poles, and piles	600	4,300	4,900	760
Cooperage and veneer	negl.	8,700	8,700	1,280
Fuel wood	80,700	19,800	100,500	53,880
Fence posts	negl.	900	900	2,140
Miscellaneous (including land clearing and domestic farm use)	10,300	2,200	12,500	5,120
Total	195,600	47,600	243,200	82,790

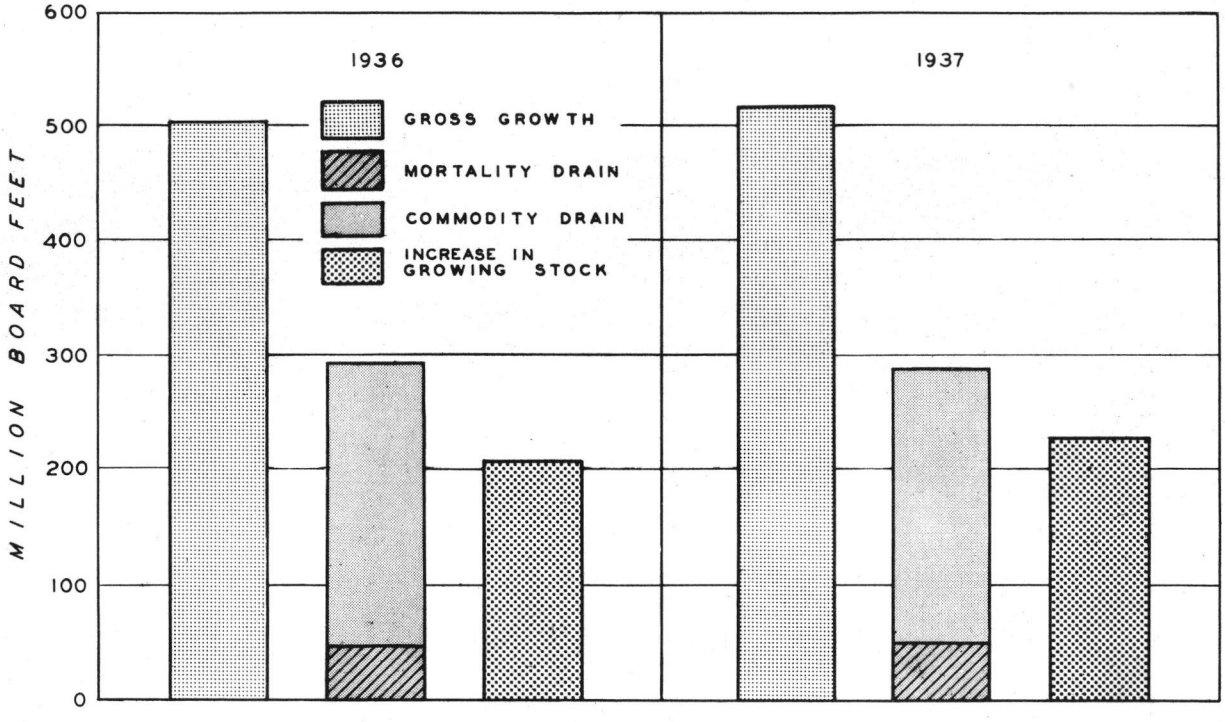

FIGURE 9.- COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

Table 17. - Comparison of increment with commodity drain, 1936 and 1937

Item	Saw-timber material			All growing stock
	Species-group		Total	
	Pines	Hardwoods		
	--- Thousand board feet (green lumber tally) ---			Thousand cubic feet (i.b.)
Net growing stock, Jan. 1, 1936	4,821,700	1,354,200	6,175,900	1,865,690
Growth	404,600	96,700	501,300	137,930
Mortality	39,200	9,500	48,700	18,540
Net increment	365,400	87,200	452,600	119,390
Commodity drain	195,600	47,600	243,200	82,790
Net increase in growing stock	169,800	39,600	209,400	36,600
Net growing stock, Jan. 1, 1937	4,991,500	1,393,800	6,385,300	1,902,290
Growth	418,300	99,000	517,300	144,960
Mortality	41,700	9,900	51,600	18,960
Net increment	376,600	89,100	465,700	126,000
Commodity drain	195,300	41,900	237,200	84,460
Net increase in growing stock	181,300	47,200	228,500	41,540
Net growing stock, Jan. 1, 1938	5,172,800	1,441,000	6,613,800	1,943,830

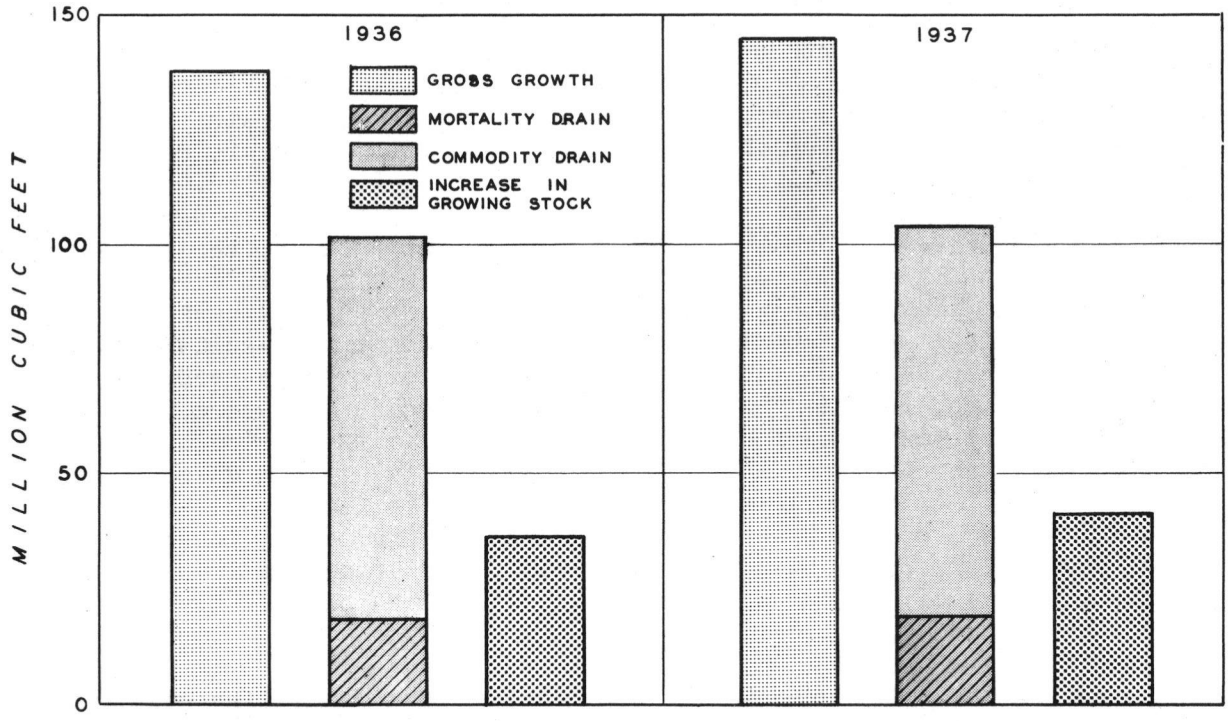

FIGURE 10.—COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

Comparison of Increment and Drain

In 1937, the net increment of saw-timber material, after deducting 52 million board feet of mortality from the gross growth, was more than 228 million board feet in excess of the commodity drain from this same class of material (table 17 and fig. 9). Thus the increase in the capital growing stock for one year (1937) amounted to almost 4 percent. For pines as well as for hardwoods the net saw-timber increment was about twice the commodity drain.

For all growing-stock material in trees 5 inches d.b.h. and larger (including those of sawlog size) the net increment, after deducting over one-quarter million cords for mortality, amounted to over 1½ million cords, bark included. It thus exceeded the commodity drain from all sources by slightly more than one-half million cords. In terms of solid wood (bark not included) the increase in the growing stock amounted to almost 42 million cubic feet (fig. 10). While it must be realized that these ratios of increment to drain for 1937 are subject to change from year to year and that immediate fluctuations are largely due to changes in the demand for forest products, it is believed that the lumber industry in 1936 and 1937 was considerably more active than in any of the 5 preceding years.

Summary and Future Outlook

From 1920 to 1930 north central Georgia witnessed a great expansion in its manufacturing enterprises (chiefly cotton textiles), an important increase in the production of hydro-electric power, and a remarkable growth in Atlanta, its largest city. The development of its land resources, however, has failed to keep step. Even the growing of cotton, its principal cash crop, has declined; and no other agricultural crop has taken its place. Although the forests have often been ignored, people are now beginning to appreciate that the forest resources may be developed to contribute much more to the wealth of the region, and thus to the welfare of the people, than they have in the past. During the settlement period and rapid expansion of agriculture, forests were considered only as an obstacle that had to be destroyed in order to provide space for crops, but farm woodlands now have come to be such a valuable asset that during times of agricultural stress, such as the period of the boll weevil epidemic, many farmers were saved from bankruptcy by the sale of forest products. In addition to being a source of cash income, however, the farm woodland furnishes a constant supply of fuel wood, fence posts, tobacco sticks, and other useful farm products. The forest and forest-products industries are an important source of employment, either on a full-time or part-time basis, for both farm and non-farm people.

In recent years the area in forests has shown a marked increase. From 1920 to 1935, according to the Census, the total land in farms increased less than 2 percent, while at the same time the farm woodland area increased about 20 percent. According to the forest survey made in 1935, approximately $2\frac{1}{2}$ million acres were classed as forest out of a total of almost $6\frac{1}{2}$ million acres. With 4 out of 10 acres in forest land, and with 3/4 of all the forest land in farm woodlands, the management of the forests of north central Georgia is part and parcel of the agricultural land-use problem. Also as shown by the Forest Survey, there are over one-half million acres of idle and abandoned agricultural land, much of which eventually will revert to forest cover unless the declining trend in cotton growing is reversed or a new cash crop is found.

Many people are leaving their rural homes and moving to the towns and cities. Between 1900 and 1930 the urban population more than tripled, while the rural population remained relatively stable. Increased opportunities for work are urgently needed. The special Census of Unemployment taken in 1937 classed 67,000 people as either unemployed and wanting work, or as emergency workers, and 33,000 as partially employed and wanting more work. The possibility of increasing the number of workers in forests and wood-using industries, therefore, certainly warrants careful consideration.

The present "happen-so" forests are in the main either old-field stands or patches of timber left on land undesirable for cultivation. Practically all the forest stands are second growth, which have been cut into several times and burned over frequently, but in spite of indifferent treatment they are still a valuable resource. As shown by the 1936 inventory, they contain over 6 billion board feet of saw-timber material, largely in second-growth loblolly pine, shortleaf pine, yellow poplar, oaks, and gums. Considering all sound material in trees 5 inches and larger, there are about 26 million cords of wood in the sound-tree growing stock.

Furthermore, the forest growing stock is increasing; a comparison of increment and drain reveals that in 1937 the volume in the saw-timber component of the stands increased over 228 million board feet, even though 237 million board feet had been removed for use and 52 million board feet had been lost through mortality. In the entire growing stock (i.e., all good trees 5 inches d.b.h. and larger), the net increase was over one-half million cords.

As shown by figures 4 and 5, the forest stands of north central Georgia are deficient in two respects: (1) considering the entire growing-stock material, the various age-classes have only one-third to one-half the volume the forest sites are capable of producing; and (2) large trees that are desirable for the manufacture of lumber, poles, veneer, and other high-quality products are relatively scarce. Forest fires and short-sighted cutting practices are the principal factors responsible for the poor stocking. Of less importance are the scarcity of seed trees and the prevalence of erosion—two factors that often prevent complete restocking of old abandoned fields.

Every year many growing-stock trees die from the effects of fire, wind, insects, lightning, drought, and the competition for space in overcrowded groups. It is estimated that this mortality drain in 1937 amounted to 52 million board feet of saw-timber material, or over one-quarter million cords of all classes of growing-stock material. This annual mortality, it is interesting to note, is far greater than the volume annually required by a pulp mill of average size, which consumes only about 150,000 cords a year. The mortality of saw-timber material is equivalent in amount to almost one-half the total lumber cut in the unit in 1937.

Fire probably causes not only much of the loss in growing-stock volume, but also tremendous losses in trees less than 5 inches d.b.h., which are essential to the recruitment of the growing stock. In addition, the periodic burning of the woods damages even more trees than it kills; the accumulated effects of this is partially reflected in the number of cull trees found in all stands and the large amount of low-grade or defective material present.

While fire protection is a prerequisite, other phases of good forest management are required in this area. Stand-improvement work, involving the removal of cull trees, slow-growing trees, and trees of inferior species, as well as close and thrifty utilization, are necessary for building up both the quality and quantity of the growing stock. Listed in the inventory (but not in the growing stock) is approximately 4 million cords of sound wood in cull trees that should be cut and utilized wherever possible. Their removal will provide additional space for the growth and development of sound growing-stock trees, and also for the establishment of additional seedlings. If utilized, this volume in cull trees will tend to supply a part of the annual requirement now cut from the sound growing-stock trees and thus accelerate the building up of a larger capital without an immediate reduction in the cut. For example, the three-fourths million cords of wood cut annually from the growing stock for fuel wood should be taken instead from the cull trees, which contain a volume sufficient to meet all the fuel-wood requirements of the entire area (almost $1\frac{1}{4}$ million cords annually) for 3 years; this would leave the growing-stock material to accumulate or to be used for higher-priced products. An

expansion and greater diversification of the market for forest products, especially for those products sold as cordwood, is needed to give forest landowners the opportunity to practice more intensive timber management.

An enlargement and intensification of forestry educational work is greatly needed in this area in order to educate landowners and the general public to an appreciation of the profits that may be realized through the protection and proper management of forest properties. The losses caused by forest fires, both to the individual landowners, to workers dependent upon the forest, and to the general public, and the methods of preventing and combating forest fires, must be impressed upon the minds of all concerned. The Legislature of Georgia has recently passed an amendment that permits the establishment of county-wide forest-fire protection, and the people of the State should take advantage of this act. Also, landowners should be shown the advantages of selective logging, stand-improvement work, and artificial reforestation, and should be taught how to accomplish these forestry measures.

An expanded market for forest material is needed to provide employment and to furnish added incentive to landowners to grow timber. The comparison of increment with commodity drain in 1937 shows that there was a surplus of over one-half million cords of net increment suitable to build up the growing stock or to support a larger forest-products industry. The present markets for forest products are inadequate to furnish a steady and profitable outlet for the low-grade material that should be removed in thinnings, improvement cuttings, and in the utilization of tops of trees cut for lumber. Any expansion of forest industries in this area, therefore, should be made with the full knowledge that much of the forest resource is suitable only for pulpwood and other relatively low-priced commodities.

No pulp mill has located in this area or in the two adjacent Survey units of Georgia. Furthermore, in 1937 no pulpwood was reported as shipped from north central Georgia to more distant areas. It appears, therefore, that on the basis of the balance between increment and drain in 1937, there is room for a pulp mill, which would greatly improve both employment and timber-marketing conditions. As more markets develop, it will be both necessary and desirable to integrate the utilization of the forest stumpage by the various forest industries, in order that the most valuable material may be converted into the products which will return the highest prices.

These industries, however, should be assured of a permanent future supply of timber by the adoption of good management practices, which will enable the forest resource to contribute permanently, and in a much greater degree than at present, to the welfare of the people.